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Government Scientific Services.

IN a presidential address to the Washington Academy of Sciences¹ Mr. Alfred H. Brooks deals with the "Scientist in the Federal Service," and incidentally provokes comparison of Government scientific services in Britain and the States. The field to be covered, as he remarks, is continental in dimensions, and the needs of upwards of one hundred millions of people have to be met. So vast a proposition is beyond the powers of private enterprise and demands the systematised efforts of national bureaus. Washington, as the city of Government, formed the natural centre of Government research, and only during the last two decades became the home of other scientific institutions. In Paris, Berlin and London, science was fostered by old universities and learned societies, and it was only in researches for which co-operation on a large scale, and the maintenance of a permanent staff, were necessary, that the Government lent its aid.

The Federal scientific worker, we are told, giving his whole time to science, may tend to lose enthusiasm, and Mr. Brooks expresses a regret, with which we fully sympathise, that the non-professional man of science, with his enthusiasm and power to vivify science, is almost unknown in Washington and would fail to find there a congenial atmosphere. But in his fear that organised science leaves no place for the amateur and that competition with highly organised corps of professionals is impossible, surely he is unduly pessimistic. In Britain, at any rate, the amateur not infrequently leads the way and indicates the channels along which professional effort should be directed.

The Federal scientific service commenced about 1816. Now there are about forty institutions and upwards of 1500 investigators. At first the obtaining of funds depended largely upon the personality of the bureau chief. Pay was scanty, regulations were few, and appointments were made too largely under political influences. As practical applications of science increased, the bureaus were enlarged, and business methods were introduced, especially after 1906, as a result of the recommendations of the Keep Commission. Still more important was the realisation by the higher Government officials of the value of science in national economic problems. The demand for men began to exceed the supply, and whereas a bare living and a God-given love for his subject had been the scientific worker's only motives, the service became a profession for which the Universities graduated scores of highly trained specialists.

The tendency of a Federal service to collect facts without providing adequate interpretation, is inevitable. Organisation leads to uniformity, and, though a good

¹ *Journ. Washington Academy of Sciences*, vol. 12 (1922), pp. 73-115.

administrator may encourage individual effort in constructive thought, more consolation is found in the fact that the rare scientific genius cannot be suppressed, though there may be some danger of his applying his originality to financial and routine matters. Familiar indeed are the difficulties which scientific workers find in complying with the regulations controlling their expenditure, or accepting the limitations which a Treasury finds, or may think, necessary to place upon it. Regulations and limitations are regarded as personal insults, for the purpose only of hampering research.

The direction of a group of strongly individualistic investigators, including, it may be, a master mind, and almost certainly several hewers of wood and drawers of water, is no light task. Originality of thought has to be encouraged, but unity of purpose must be maintained in order to achieve the results demanded under the grant. The delinquents in such a group are usually unconscious of any delinquency, as for example the dilettante who flits from one problem to another and believes that he fulfils all obligations if he merely remains on the pay-roll; the brilliant mind that is so undisciplined that it cannot be made to formulate conclusions; or the hard-working procrastinator who dare not put forward his conclusions for fear of omitting some detail. Less deserving of sympathy are the pests who are as quick as a hair-trigger in publishing, and rush into print where more experienced men fear to tread, or the self-selected mouthpiece, who, unwilling to hide his light under a bushel, constitutes himself the agency by which science reaches the average man, and is too often taken at his own valuation. The "professional prominent scientist," another familiar type, at one time formed the popular authority in Washington. His dictum on any new problem was final, but he was more highly reputed by the public than by his colleagues.

A criticism passed on all men of science, not only by Mr. Brooks but also by literary men in Great Britain, relates to the form in which science is presented. The greatest need of the average American, and we may add of the British man of science, is to write clear English. He conveys his message to the people in language they cannot understand, and often he and his colleagues fail to understand one another. The development of such curiously similar types on the two sides of the Atlantic is interesting.

On the outbreak of war the Federal service proved its true worth. The bureaus formed the backbone of war service, for they were immediately available as storehouses of scientific facts and their great corps were quickly turned on to war problems. One result was to reveal the high commercial value of science, with the

consequence that the ranks of the Federal service have been most seriously depleted. The best-trained men are now tempted away by the financial prospects of a commercial career, and the second choice only is left to the Government. It is suggested that the change may be due to the lowering of the ideals of the student, for the professor who is compelled to eke out a small salary by taking commercial work or writing text-books for profit, has not the same influence as a "revered master" in research. Without disparaging the high ideal attributed to the student, one is tempted to think that the possibilities of far higher emoluments in commercial service than could be justified in a Government bureau, are the principal inducement.

Pay, however, is not everything. Mr. Brooks reminds us that the young investigator who has obtained a post in the Government service, finds himself a member of a corps of well-trained enthusiastic professional men, whose actions earnestly express public duty and self-sacrifice. He will enjoy among them and in the non-professional societies congenial scientific companionship, and he will realise that the mere mass of such an army of investigators, whose ideals are not less lofty because they include the welfare of mankind, give an inspiration not excelled elsewhere.

A. S.

The Design of Electric Power Stations.

Power House Design. By Sir J. F. C. Snell. (Longmans' Electrical Engineering Series.) Second edition. Pp. xi + 535. (London: Longmans, Green and Co., 1921.) 42s. net.

THE second edition of this important work will be welcomed by all engineers who are interested in power-station design. The author is the chairman of the Electricity Commissioners; he has been both a distributing and a consulting engineer, and has therefore studied the problem from all points of view. The book is a storehouse of facts which will be of great value to the designer. The general principles which should be followed are laid down and illustrated by clear descriptions of many modern power stations. It is interesting to note that these stations are of very varied design. This is doubtless due partly to the individual experience of the designers, but it also bears out the author's contention that every case must be considered on its own merits, and so the solution applicable in one case may be unsuitable in another. The apparatus inside a power station should be standardised as much as possible, but at the present time it would be inadvisable to attempt to standardise the station itself.

The modern fashion is to concentrate generating